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Age-related gap in the management of heart failure patients. The National Project of Prevention and Treatment of Cardiovascular Diseases — POLKARD

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Abstract

Background: *Heart failure (HF) is strongly associated with aging. It affects 10–12% of patients older than 80 years, with five-year overall mortality after first hospitalization for HF being as high as 81%. The main objective of this study was to assess the diagnosis and treatment of HF in hospitalized octogenarians compared to younger subjects.*

Methods: *The survey was performed among a random sample of all Polish hospitals and in all academic centers, as part of the National Project of Prevention and Treatment of Cardiovascular Diseases in Poland — POLKARD. Using a questionnaire-based method, hospital documentation of the last five patients with diagnosed HF was reviewed. Eventually, in 2005, HF patients of 259 internal medicine and cardiology hospital wards, including 260 very elderly patients, were selected to the study.*

Results: *The mean age of the 1,289 studied patients was 69.8 ± 11.4 years (age range: 26–96 years), 57.8% were males, and 80.1% were in NYHA class III or IV. Echocardiography was performed in 41.7% of octogenarians in comparison with 58.7% of those categorized as 'younger elderly', i.e. 60–79 years, and 75.2% of patients aged below 60 years ($p < 0.0001$). The most prescribed drugs in very elderly patients were diuretics (86.9%, $p = 0.005$) and ACE-I (81.9%), while only 61.5% used beta-blockers ($p < 0.0001$). In stepwise logistic regression analysis, hypertension, history of myocardial infarction and admission to cardiology ward were positively associated with beta-blocker and ACE-I (or ARB) therapy, while older age and pulmonary diseases (COPD or asthma) were related to their non-prescription.*

Conclusions: *Despite significant progress in HF management, there is still a need for an improvement in the medical care of very elderly patients. The major obstacles seem to be advanced age and the presence of coexistent pulmonary diseases. Therefore, the participation of geriatricians and pulmonologists should be recommended in caring for octogenarians with HF.*
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Key words: heart failure, elderly, diagnosis, treatment, hospital

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Introduction

Heart failure (HF) affects approximately 5% of the adult population of Western Europe [1]. Due to improved outcomes in cardiovascular diseases and prolonged lifespans, HF represents an increasing problem for public healthcare , and is now the commonest diagnosis in the population of patients aged over 65 who have been discharged from hospital [2]. HF is strongly associated with aging. It affects 10––12% of patients older than 80 years, with five-year overall mortality after first hospitalization for HF being as high as 81% [3, 4].

The international research project the Euro Heart Failure Survey (EHFS) [5, 6], which was also performed in Poland, revealed a gap between the hospital care of patients with HF and the European Society of Cardiology (ESC) guidelines [7]. This project focused on European patients hospitalized for HF, and showed age-related suboptimal management regarding both diagnostic procedures and pharmacotherapy [8, 9]. However, centers invited to participate in this and similar HF surveys were largely based on university hospitals [5, 6, 10, 11], so the data only partially represented general hospital practice.

The present study was performed as part of the National Project of Prevention and Treatment of Cardiovascular Diseases — POLKARD [12]. The aim of the presented analysis was to assess HF diagnosis and treatment in Polish hospitals in very elderly patients (over 80 years old) in comparison with younger elderly (60–79 years old) and patients under 60 years of age.

Methods

The multi-stage procedure of choosing hospitals to be investigated, which was designed to obtain a representative sample of both medical wards and HF patients discharged from hospitals, has been previously published in detail [12, 13]. Stratified multistage sampling of hospitals was based on the governmental registration list (posted on 17 March 2005). A total of 260 hospitals (of which one refused to take part in the research) with internal medicine and cardiology departments were approached. All Polish university hospitals were asked to participate in the study. The percentage of patients treated at university hospitals in the present analysis was 10.1%. Consequently, from 21 April to 31 December 2005, the medical records of the last five patients discharged with a diagnosis of HF were analyzed.

Data was obtained from HF patients' medical files concerning their medical history, diagnostic and therapeutic procedures by specially trained nurses.

In total, 1,289 patients who had been discharged alive from hospital with an HF diagnosis were enrolled into the analysis; 20.2% of these patients were at least 80 years old. Active neoplastic disease was the only exclusion criterion. All procedures of data gathering were subject to Polish regulations.

Statistical analysis

The study population is described by percentages and absolute numbers. The distribution of continuous variables is characterized by means and standard deviations. Categorical variables were compared between subgroups by χ^2 test and continuous variables by analysis of variance (ANOVA test). Age was analyzed as a continuous and categorical variable (< 60, 60–79 and ≥ 80 years). Two-sided p value tests were performed.

Determinants for the use of beta-blockers, spironolactone and a combination of beta-blocker with angiotensin-converting enzyme inhibitor (ACE-I) or angiotensin II receptor blocker (ARB) medication were analyzed by stepwise multiple logistic regression. Clinical characteristics: age, gender, New York Heart Association (NYHA) class, HF with preserved ejection fraction (HFPEF), HF type, admission ward, intensive care unit (ICU) stay, and co-morbidities: hypertension, ischemic heart disease, atrial fibrillation (AF), chronic obstructive pulmonary disease (COPD) or asthma, renal dysfunction, prior stroke or transient ischemic attack (TIA), myocardial infarction (MI) or invasive cardiology treatment were considered for inclusion in the models.

The multiple logistic regression variables choice was based on a significance level of $p < 0.1$ in the univariate comparison; a p value < 0.05 was set up for variables entered into the closing model. Finally, gender, age, hypertension, COPD or asthma, MI, renal insufficiency, HFPEF and admission to cardiology ward gained statistical significance and were involved.

A significance level of 0.05 was assumed for statistical tests. Statistical analyses were completed with Statistica 8.0 PL (StatSoft, Poland).

Results

Patients' characteristics

Mean age of the 1,289 patients was 69.8 ± 11.4 (age range: 26–96) years. Most of them were males

Table 1. Characteristics of the study population (n = 1,289) divided by age group.

	Age ≥ 80 (n = 260)	Age 60–79 (n = 754)	Age < 60 (n = 275)	P
Male gender	41.6% (106/255)	55.1% (405/735)	80.4% (217/270)	< 0.0001
Age (years)	84.0 ± 3.5	71.1 ± 5.3	52.8 ± 6.2	< 0.0001
NYHA class:				
I	0.0% (0/256)	0.5% (4/746)	1.8% (5/273)	
II	15.6% (40/256)	19.8% (148/746)	20.9% (57/273)	0.082
III	53.9% (138/256)	51.9% (387/746)	47.3% (129/273)	
IV	30.5% (78/256)	27.8% (207/746)	30.0% (82/273)	
Cardiovascular diseases:				
Hypertension	78.1% (203/260)	74.7% (553/740)	58.1% (158/272)	< 0.0001
CAD	78.4% (196/250)	75.6% (551/729)	64.9% (172/265)	< 0.001
Myocardial infarction	30.9% (77/249)	38.1% (276/724)	40.0% (104/260)	0.070
Atrial fibrillation	49.6% (126/254)	47.2% (349/740)	28.8% (76/264)	< 0.0001
Co-morbidities:				
Diabetes	29.8% (76/255)	36.7% (274/746)	27.4% (74/270)	0.008
TIA or stroke	14.6% (36/246)	12.6% (93/736)	7.8% (21/268)	0.043
Anemia	16.8% (43/256)	10.7% (79/742)	8.7% (23/265)	0.008
COPD or asthma	25.3% (64/253)	20.0% (148/740)	14.7% (39/266)	0.010
Renal failure	28.4% (72/254)	19.6% (145/740)	10.8% (29/268)	< 0.0001
Liver disease	4.8% (12/248)	10.8% (78/722)	19.5% (51/261)	< 0.0001
Obesity	21.9% (55/251)	37.2% (273/734)	37.9% (102/269)	< 0.0001

Numbers in brackets indicate: frequency/available data; NYHA — New York Heart Association; CAD — coronary artery disease; TIA — transient ischemic attack; COPD — chronic obstructive pulmonary disease

(57.8%), and 80.1% presented HF in NYHA class III or IV (Table 1). Most of the NYHA class I cases were diagnosed in patients under 60 years old, while NYHA classes III–IV were diagnosed most frequently in patients over 80 years of age.

Coronary artery disease, hypertension and AF were more frequently observed in very elderly participants compared to patients between 60 and 79 years and subjects under the age of 60. Co-morbidities including stroke/TIA, anemia, COPD or asthma and renal failure were more common in octogenarians, whereas liver disease and obesity were more often found in the youngest investigated group. Details of patients' characteristics are shown in Table 1.

Almost 76% of patients over 80 years and 71% of persons aged 60–79 were treated at internal medicine wards; younger patients were treated more frequently in cardiology departments (51%, $p < 0.0001$). Of all HF patients, 32.7% were admitted to ICU, with a similar length of stay in all age groups (4.7 ± 4.6 days).

Diagnostics

Only 41.7% of very elderly patients in comparison with younger patients underwent echocardiography during the surveyed hospitalization ($p < 0.0001$; Table 2). B-type natriuretic peptide (BNP) was measured in only 1.2% of very elderly patients and in 8.4% of persons in the youngest group. The commonest reason (in about 60% of cases) for not estimating BNP levels in all age groups was the low availability of this test.

Coronarography, 24-h ECG and exercise test were significantly less frequently performed in octogenarians. An analogous tendency was observed for spirometry, while chest radiogram was more often made in the oldest age group (Table 2).

Pharmacological treatment

As we have published elsewhere [13], the most frequently used medication in all HF patients were diuretics (86.8%; Table 3). ACE-I and ARBs were used with similar frequency in all compared age-groups. Beta-blockers, spironolactone, as well as a combination of beta-blockers and ACE-I (or ARB) were less commonly prescribed in patients ≥ 80 years old compared to both younger age groups. Antiplatelet therapy was more commonly used in octogenarians ($p < 0.03$). Statins were more likely to be prescribed in younger patients, compared to patients aged 60–79 or octogenarians, respectively 45.8%, 38.7% and 26.9%; $p < 0.001$ (Table 3).

Table 2. Procedures performed in heart failure patients during surveyed hospitalization.

	Age ≥ 80 (n = 260)	Age 60–79 (n = 754)	Age < 60 (n = 275)	P
BNP/NT-proBNP	1.2% (3/241)	2.5% (18/709)	8.4% (22/263)	< 0.001
Urine test	91.9% (239/260)	91.7% (685/747)	84.6% (230/272)	0.001
Chest X-ray	82.6% (213/258)	79.9% (591/740)	72.1% (196/272)	0.007
Echocardiography	41.7% (108/259)	58.7% (442/753)	75.2% (206/274)	< 0.0001
Coronarography	1.9% (5/260)	4.7% (35/752)	16.4% (45/275)	< 0.0001
Spirometry	4.1% (10/247)	6.4% (45/705)	9.3% (24/258)	0.056
24-h ECG	9.7% (24/247)	17.4% (123/708)	25.7% (67/261)	< 0.0001
Exercise test	0.4% (1/245)	5.9% (41/700)	12.8% (33/258)	< 0.0001

Numbers in brackets indicate: frequency/available data; BNP — B-type natriuretic peptide; NT-proBNP — N-terminal pro-BNP; ECG — electrocardiography

Table 3. Heart failure pharmacotherapy during hospitalization.

	Age ≥ 80 (n = 260)	Age 60–79 (n = 754)	Age < 60 (n = 275)	P
ACE-I	81.9% (213/260)	84.2% (635/754)	82.6% (227/275)	0.632
ARB	1.2% (3/260)	2.1% (16/754)	2.2% (6/275)	0.588
Beta-blocker	61.5% (160/260)	74.5% (562/754)	83.3% (229/275)	< 0.0001
Combination of ACE-I or ARB and beta-blocker	52.7% (137/260)	65.8% (496/754)	72.4% (199/275)	< 0.0001
Diuretics (except for spironolactone)	86.9% (226/260)	88.9% (670/754)	81.1% (223/275)	0.005
Spironolactone	56.9% (148/260)	61.5% (464/754)	71.6% (197/275)	0.001
Digitalis	41.2% (107/260)	38.6% (291/754)	33.5% (92/275)	0.164
Antiplatelet treatment	72.7% (189/260)	63.7% (480/754)	66.6% (183/275)	0.029

Numbers in brackets indicate: frequency/available data; ACE-I — angiotensin-converting enzyme inhibitor; ARB — angiotensin II receptor blocker

Previous MI was positively associated with beta-blockers prescription (OR = 1.89; 95% CI 1.40–2.55), whereas age (OR = 0.98; 95% CI 0.96–0.99) and a history of respiratory disease (OR = 0.43; 95% CI 0.31–0.59) were related to their non-prescription (all data is significant at $p < 0.001$).

The combination of beta-blockers and ACE-I (or ARBs), hypertension, history of MI, and admission to cardiology department were positively related to their prescription, while increased age and presence of asthma or COPD were predictors of non-prescription (Fig. 1).

Older age, male gender, the presence of hypertension, renal failure, and HFPEF were associated with non-spironolactone therapy (Fig. 2).

Invasive procedures

We found that 26.5% of patients in the youngest group *vs* 18.7% of subjects 60–79 years of age and 6.0% of octogenarians ($p < 0.0001$) had undergone interventional cardiology procedures or cardiac surgery during their last hospitalization or in the past (17.8% of all investigated HF patients).

The commonest cardiac surgery procedure in the group of very elderly patients was pacemaker implantation (10.4%); this procedure was performed respectively in 11.2% and 1.8% of patients aged 60–79 and < 60 years ($p < 0.001$). Marked differences between HF octogenarians, younger elderly patients (60–79 years old) and patients < 60 years of age were observed in prevalence of balloon angioplasty (respectively: 4.6% *vs* 12.5% *vs* 23.8%, $p < < 0.0001$), stent implantation (3.8% *vs* 14.1% *vs* 25.0%, $p < 0.0001$), coronary artery bypass grafting (1.5% *vs* 9.1% *vs* 10.7%, $p = 0.008$) and valvular procedures (0.0% *vs* 3.6% *vs* 6.5%, $p = 0.011$).

There were no significant differences between age-category groups in cardiac resynchronization therapy (performed in eight patients), implantation of cardioverter-defibrillator (18 patients) or heart transplantation (two patients).

Discussion

We analyzed a population of hospitalized HF patients divided into three age categories. Octoge-

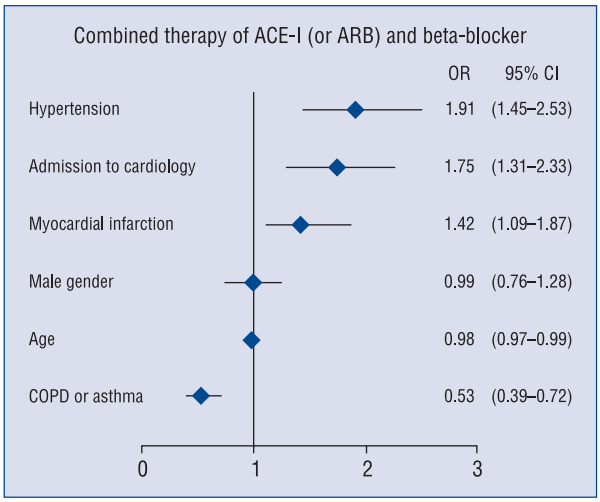

Figure 1. Determinants of combined therapy of angiotensin-converting enzyme inhibitor (ACE-I) or angiotensin II receptor blocker (ARB) and beta-blocker in heart failure patients; COPD — chronic obstructive pulmonary disease; OR — odds ratio; CI — confidence interval; all data except for gender is significant at $p < 0.05$.

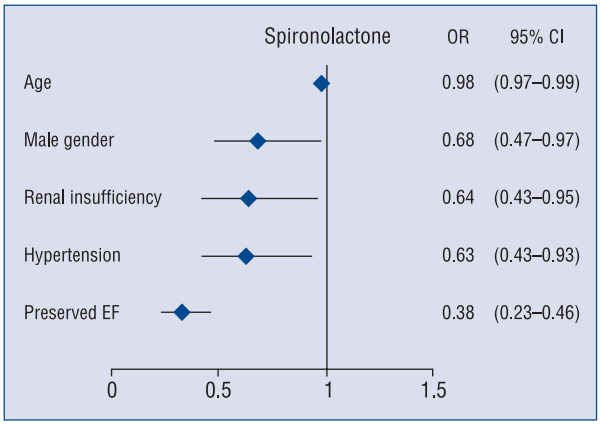

Figure 2. Determinants of spironolactone therapy in heart failure patients; EF — ejection fraction; OR — odds ratio; CI — confidence interval; all data is significant at $p < 0.05$.

narians were more frequently women, with more cardiovascular diseases (hypertension, coronary artery disease, AF) and higher presence of co-morbidities (stroke/TIA, anemia, COPD/asthma, renal failure), while liver insufficiency and obesity were more common in younger patients. In the studied group of very elderly patients when compared to previous European surveys [8, 9], we observed a similar predominance of women, occurrence of AF, and diabetes, while coronary artery disease and hypertension were more prevalent.

Only 10% of the patients included in our study were treated in university hospitals. Most other significant studies of HF patients have recruited significantly more from university hospitals. The figures are: in Euro Heart Failure Survey (EHFS) I and II, Acute Decompensated Heart Failure National Registry (ADHERE) and Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF): 50%, 47%, over 30% and over 56%, respectively [6, 10, 11, 14]. This may partly explain some differences in HF management between studies, suggesting more optimal management in academic centers.

The presented POLKARD study demonstrates an underuse of recommended HF diagnostic procedures in octogenarians. Coronarography was performed in only 1.9% of octogenarians and in 17% of very elderly patients in the EHFS II. An optimistic tendency observed in EHFS II of a doubling in-echocardiography assessment in octogenarians when compared to EHFS I (from 38.4% to 81.0%) was not confirmed in our analysis (only 41.7% of patients with left ventricular ejection fraction record). Taking into account the results of the study of Lien et al. [15] concerning HF in frail elderly patients of median age 86 years, which showed that the specificities of clinical signs, chest X-rays and abnormal ECGs for HF were low (respectively: 50%, 20% and 9%), it seems that a diagnosis based on symptoms and X-ray might be misleading in elderly HF patients. Since the EHFS I was conducted, prescribing rates for beta-blockers, ACE-I/ARB and their combination in discharged alive octogenarians has increased when compared with the POLKARD Study (beta-blockers from 25% to 61.5%; ACE-I/ARB from 56% to 82.7% and a combination of beta-blocker and ACE-I/ARB from 15% to 52.7%), with an only slightly lower percentage of patients with respiratory disease (EHFS I: 32.2%; POLKARD: 25.3%). Similarly to the Worcester Heart Failure Study, [11] we found that older patients were less likely to be prescribed lipid-lowering agents.

Very few previously published studies comparing the clinical features in HF management between different age groups, have reported invasive cardiology procedures. Poor prognosis [4] in HF and the high costs [2] of certain invasive cardiology procedures may explain some differences in their performance between age groups. We have found that 10.4% of very elderly patients were treated with pacemaker implantation, which indicates no significant difference to prior European investigation (10.1% of octogenarians in EHFS I) [8].

Our obtained results show differences in characteristics, diagnostic procedures, pharmacological and invasive treatment of octogenarians compared to younger HF patients. These findings are consistent with previously published large epidemiological studies [8, 9, 16–19].

The results of our study must be interpreted within context of its potential limitations. In the present study, we did not assess hospital stays which concluded in the patient's death, and data was collected retrospectively based on medical records. Also, the data was gathered six years ago.

Possible causes of age-related gap in heart failure management

Hospital management of the very elderly with HF may often be suboptimal, compared to guidelines, because of the specificity of geriatrics. The difficulties of managing elderly patients are associated with the very prevalent and increasing risk of death, co-morbidities including poor mental and physical status, expected noncompliance, orthostatic hypotension plus other factors leading to an increased risk of falls, and polypragmasy [20–22]. Furthermore, older groups more frequently have contraindications to diagnostic and therapeutic procedures, as well as difficult access to selected diagnostic investigations. Poor elderly representation in clinical trials may also partly explain what we found in the studied population of octogenarians, i.e. suboptimal management from the point of view of ESC guidelines [23].

Suggestions for future improvement

Adherence of physicians to guidelines of treatment seems to be a strong predictor of fewer cardiovascular hospitalizations and better outcomes [24]. These observations may support an urgent need for the wide introduction of educational programs on geriatrics for cardiologists [25]. As an example, participation in OPTIMIZE-HF was associated with a high rate of left ventricular assessment and an increase in evidence-based therapy from the program's beginning [26].

We suggest that clinicians treating patients with HF should indicate the results of the diagnostic procedures (especially ejection fraction or the presence of diastolic dysfunction) on which the diagnosis was based. They should also document contraindications to the use of recommended therapies, in particular on discharge cards, to bring these to the attention of other doctors, including general practitioners.

Taking into account the described age-related gap in the management of elderly patients, we believe that HF care may be improved by multidisciplinary management. The involvement of geriatricians, other internal medicine specialists (e.g. pulmonologists), and (in advanced HF) specialists in palliative medicine may be helpful. Moreover, those caring for elderly patients, especially those with poor physical and mental status, should be comprehensively educated as to HF symptoms and treatment.

Finally, because the described disparities could result from the limited amount of evidence-based data on HF in the elderly, we suggest that elderly patients should be more adequately represented in future clinical trials, or that systematic registries should be carried out and analyzed in these patients.

Conclusions

Despite significant progress in HF management, there is still a need for an improvement in the medical care of very elderly patients. The major obstacles seem to be advanced age and the presence of coexistent pulmonary diseases. Therefore, the participation of geriatricians and pulmonologists should be recommended in caring for octogenarians with HF.

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The institution where work was performed: Department of Internal Medicine and Gerontology, Jagiellonian University Medical College, Kraków, Poland.

Conflict of interest: none declared

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